

REMARKS

In this Amendment, Applicants amend claims 1-4, 6-8, 11-13, 15, and 17 in order to more appropriately define the present invention. No new matter is added. Claims 1-31 are pending in this application, with claims 18-31 withdrawn from consideration as directed towards a non-elected invention.

In the Office Action, the Examiner rejected claims 1-7, 10-14, and 16-17 under 35 U.S.C. § 103(a) as being unpatentable over "Grimbergen et al. (U.S. [Patent No.] 6,406,924) and Nozawa et al. (U.S. [Patent No.] 6,224,667) in view of each other;" and rejected claim 15 under 35 U.S.C. § 103(a) as being unpatentable over Grimbergen and Nozawa et al. in view of Saito et al. (U.S. Patent No. 5,565,114). The Examiner further indicated that claims 8 and 9 would be allowable if rewritten in independent form including all the limitations of the base claim and any intervening claims. Applicants acknowledge with appreciation the Examiner's indication that claims 8 and 9 are drawn to allowable subject matter.

The rejection of claims 1-17 is respectfully traversed based on the following remarks.

Rejection under 35 U.S.C. § 103(a)

Applicants traverse the rejection of claims 1-17 because a *prima facie* case of obviousness has not been established by the Examiner.

In order to establish a *prima facie* case of obviousness, three basic criteria must be met. First, the prior art reference (or references when combined) must teach or suggest all the claim elements. Second, there must be some suggestion or motivation, either in the references themselves or in the knowledge generally available to one of

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ordinary skill in the art, to modify a reference or to combine reference teachings. Third, there must be a reasonable expectation of success. See M.P.E.P. § 2143.

I. Claims 1-7, 10-14, and 16-17

Present independent claim 1 recites a plasma processing method comprising, among other things, "introducing again at least a part of [a] process gas exhausted from [a] process chamber into said process chamber; obtaining a predetermined property value to monitor the state of [a] plasma of said process gas within said process chamber; and controlling an introducing condition of said process gas into said process chamber so as to adjust said predetermined property value to a regulated value."

In contrast to the present claimed invention, Grimbergen et al. discloses a method that "is useful for detecting completion of a process stage or an endpoint of a process." Id. at col. 5, lines 41-42. More specifically, Grimbergen et al. discloses a chamber 28 comprising an endpoint detection system 56 to detect an endpoint of a stage of the process being performed on a substrate 20. Id. at col. 6, lines 29-31. Grimbergen et al. further discloses a radiation source 58 for emitting radiation and a radiation detector 62 for detecting radiation 64 reflected by the substrate 20. Id. at col. 7, lines 14-17 and Fig. 2. The reflected radiation is used to monitor the thickness of a layer 22, which "is examined by an operator to determine a desired stopping point for the process being conducted on the substrate 20." Id. at col. 11, lines 32-34. However, Grimbergen et al. does not teach or suggest at least obtaining a predetermined property value to monitor the state of a plasma of a process gas within a process chamber; and controlling an introducing condition of said process gas into said process chamber so as to adjust said predetermined property value to a regulated value, as recited in claim 1.

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Grimbergen et al. merely discloses monitoring the reflected radiation, which is measure of the state of the substrate and not the state of the plasma, as claimed.

Further, because Grimbergen et al. does not disclose any method for monitoring the state of the plasma, it necessarily also does not teach or suggest at least “obtaining a predetermined property value to monitor the state of a plasma of a process gas” and “controlling an introducing condition of said process gas into said process chamber so as to adjust said predetermined property value to a regulated value,” as recited in claim 1. The Examiner alleges that Grimbergen et al. discloses “controlling (via gas flow controller 40) in a gas flow so as to adjust a predetermined property value to a regulated value (Fig. 2).” Office Action at page 3. However, the gas flow controller 40 merely controls the flow rate of the process gas and does not teach or suggest at least controlling an introducing condition of process gas ... so as to adjust said predetermined property value [to monitor the state of the plasma of a process gas into a process chamber] to a regulated value, as claimed.

In the method disclosed in Grimbergen et al., upon the detection of an endpoint signal (from the reflected radiation), a new process condition is implemented, for example, by changing to a new gas flow rate. In other words, Grimbergen et al. merely discloses switching from a first process condition to a second process condition, when a characteristic feature in the trace of the reflected intensity is detected. Id. at col. 14, lines 61-64. The method disclosed in Grimbergen et al. does not teach or suggest at least controlling an introducing condition of process gas ... so as to adjust said predetermined property value [to monitor the state of the plasma of a process gas into a process chamber] to a regulated value, as claimed.

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Moreover, as also admitted by the Examiner, Grimbergen et al. does not teach or suggest at least "introducing again at least a part of [a] process gas exhausted from [a] process chamber into said process chamber," as recited in claim 1.

Nozawa et al. does not cure the deficiencies of Grimbergen et al. noted above. Nozawa et al. discloses a gas recovery unit for liquefying and recovering a cleaning gas and to reuse the recovered cleaning gas. More specifically, Nozawa et al. discloses an exhaust discharge portion for releasing an exhaust gas, which is subsequently filtered with device B, cooled, and liquefied to recover the cleaning gas, and supplying the recovered cleaning gas. Id. at Fig. 1. However, Nozawa et al. does not teach or suggest at least "introducing again at least a part of [a] process gas exhausted from [a] process chamber into said process chamber; obtaining a predetermined property value to monitor the state of [a] plasma of said process gas within said process chamber; and controlling an introducing condition of said process gas into said process chamber so as to adjust said predetermined property value to a regulated value," as recited in claim 1. In particular, in the method of Nozawa et al., since the recovered cleaning gas has been filtered, cooled, and liquefied, there is no need to control the introducing condition of the process gas. In other words, in Nozawa et al., the recovered cleaning gas is controlled in the same manner as the newly introduced cleaning gas.

Furthermore, Nozawa et al. does not teach or suggest at least obtaining a predetermined property value to monitor the state of a plasma of a process gas, as claimed.

Therefore, Grimbergen et al. and Nozawa et al., either taken alone or in combination, do not teach or suggest at least "introducing again at least a part of [a]

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process gas exhausted from [a] process chamber into said process chamber; obtaining a predetermined property value to monitor the state of [a] plasma of said process gas within said process chamber; and controlling an introducing condition of said process gas into said process chamber so as to adjust said predetermined property value to a regulated value,” as recited in claim 1.

Moreover, the Examiner alleges that “[i]t would have been obvious to one having ordinary skill in the art, at the time of invention, to modify Grimbergen in view of Nozawa by re-circulate (*sic*) the exhausted gas because it will reduce the cost for the process gas.” Applicants disagree with the Examiner’s allegations and conclusions as an unsubstantiated statement of questionable relevance to Applicants’ claimed invention. Applicants further refer the Examiner to the February 21, 2002 Memorandum from USPTO Deputy Commissioner for Patent Examination Policy, Stephen G. Kunin, regarding “Procedures for Relying on Facts Which are Not of Record as Common Knowledge or for Taking Official Notice.” In relevant part, the Memorandum states, “If the examiner is relying on personal knowledge to support the finding of what is known in the art, the examiner must provide an affidavit or declaration setting forth specific factual statements and explanation to support the finding” (Memorandum, p. 3). Further, the Memorandum indicates that the Federal Circuit has “criticized the USPTO’s reliance on ‘basic knowledge’ or ‘common sense’ to support an obviousness rejection, where there was no evidentiary support in the record for such a finding.” *Id.* at 1.

Applicants submit that “[d]eficiencies of the cited references cannot be remedied by the Board’s general conclusions about what is “basic knowledge” or “common sense.”” *In re Lee*, 61 USPQ2d 1430, 1432-1433 (Fed. Cir. 2002), quoting *In re Zurko*,

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59 USPQ2d 1693, 1697 (Fed. Cir. 2001). Should the Examiner maintain the rejection after considering the arguments presented herein, Applicants submit that the Examiner must provide "the explicit basis on which the examiner regards the matter as subject to official notice and [allow Applicants] to challenge the assertion in the next reply after the Office action in which the common knowledge statement was made" (Id. at 3, emphasis in original), or else withdraw the rejection.

Further to demonstrating that combining the teachings of Grimbergen et al. with those of Nozawa et al. does not result in Applicants' claimed invention, Applicants respectfully submit that Grimbergen et al., in fact, teaches away from such a combination. Grimbergen et al. discloses that it is preferred to have a radiation source 58 that provides nonpolarized radiation because variations in the intensity of the polarized radiation reflected from the substrate 20 can be masked by changing absorption characteristics of the energized gas or plasma. Id. at col. 6, lines 55-60. In other words, since the method disclosed in Grimbergen et al. is used to detect an endpoint for a process based on the characteristics of the reflected radiation, it would be inconsistent to monitor the state of the plasma to determine the endpoint of the process. In view of such teachings away, there is no motivation to combine the teachings of Grimbergen et al. with those of Nozawa et al. to produce Applicants' present claimed invention. Likewise, there would be no reasonable expectation of success from doing so.

In summary, the Examiner has failed to make a *prima facie* case of obviousness for claim 1. Therefore, the rejection of claim 1 under 35 U.S.C. § 103(a) is improper, and Applicants respectfully request the Examiner to withdraw the rejection and the claim

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be allowed. Claims 2-7 and 10 are also allowable at least in view of their dependency from allowable claim 1.

Present independent claim 11 contains recitations similar to allowable claim 1. Specifically, claim 11 recites a plasma processing method comprising, among other things, "obtaining a predetermined property value to monitor the state of said plasma of said process gas within said process chamber; exhausting said process gas from said evacuated process chamber; introducing again at least a part of said process gas exhausted from said process chamber into said process chamber; and controlling an introducing condition of said process gas into the process chamber so as to adjust said predetermined property value to a regulated value, said introducing condition being controlled in accordance with changing a circulating ratio, which is a ratio of the flow rate of the process gas introduced again into the process chamber to the flow rate of the entire process gas introduced into the process chamber; wherein said state of said plasma is correlated to the process characteristics of said target object; and said regulated value is determined by a property value obtained before changing the circulating ratio accompanied with changing said state of said plasma."

For reasons discussed above regarding claim 1, Grimbergen et al. and Nozawa et al., either taken alone or in combination, do not teach or suggest at least the above-quoted elements of claim 11. Further, as also discussed above regarding claim 1, there is no motivation to combine the teachings of Grimbergen et al. with those of Nozawa et al. to produce Applicants' present claimed invention. Likewise, there would be no reasonable expectation from doing so.

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Therefore, Applicants submit that the Examiner has failed to establish a *prima facie* case of obviousness for claim 11. Accordingly, Applicants respectfully request the Examiner to withdraw the rejection of claim 11 under 35 U.S.C. § 103(a) and the claim be allowed. Claims 12-14 and 16-17 are also allowable at least in view of their dependency from allowable claim 11.

Claim 15

The Examiner rejected claim 15 under 35 U.S.C. § 103(a) as being unpatentable over Grimbergen et al. and Nozawa et al. in view of Saito et al. Applicants respectfully traverse the rejection of claim 15 for the following reasons.

Claim 15 depends from claim 11. As discussed above, Grimbergen et al. and Nozawa et al. fail to teach or suggest at least "obtaining a predetermined property value to monitor the state of said plasma of said process gas within said process chamber; exhausting said process gas from said evacuated process chamber; introducing again at least a part of said process gas exhausted from said process chamber into said process chamber; and controlling an introducing condition of said process gas into the process chamber so as to adjust said predetermined property value to a regulated value, said introducing condition being controlled in accordance with changing a circulating ratio, which is a ratio of the flow rate of the process gas introduced again into the process chamber to the flow rate of the entire process gas introduced into the process chamber; wherein said state of said plasma is correlated to the process characteristics of said target object; and said regulated value is determined by a property value obtained before changing the circulating ratio accompanied with changing said state of said plasma," as recited in claim 11.

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Saito et al. fails to cure these deficiencies of Grimbergen et al. and Nozawa et al. Saito et al. discloses a method of detecting an end point of a plasma process comprising continuously detecting the emission spectrum of an active species in plasma by means of a photodetector. Id. at col. 2, lines 8-13. Saito et al. further discloses CF-based gas which dissociates in the plasma to produce various active species such as CF₂. However, Saito et al. does not teach or suggest at least controlling an introducing condition of a process gas into a process chamber so as to adjust a predetermined property value to a regulated value, said introducing condition being controlled in accordance with changing a circulating ratio ... wherein said state of said plasma is correlated to the process characteristics of said target object; and said regulated value is determined by a property value obtained before changing the circulating ratio accompanied with changing said state of said plasma, as claimed. In other words, Saito et al. merely discloses detecting the emission spectrum from CF₂ as a means of endpoint detection and does not teach or suggest the above-quoted recitations of claim 11.

Therefore, Grimbergen et al., Nozawa et al., and Saito et al., either taken alone or in combination do not teach or suggest each and every element of independent claim 11. Accordingly, a *prima facie* case of obviousness is not established for claim 11 and for claim 15 which depends from claim 11. Therefore, the rejection of claim 15 under 35 U.S.C. § 103(a) is improper, and Applicants respectfully request the Examiner to withdraw the rejection of claim 15 and the claim be allowed.

In view of the foregoing remarks, Applicants respectfully request reconsideration and reexamination of this application and the timely allowance of the pending claims.

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Respectfully submitted,

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